



Infrastruct CS Ltd

Consulting Civil Engineers

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28th October 2022

REF: 4553-TECH-ICS-CO-C-03.003

OXFORD TECHNOLOGY PARK, UNIT 5A-5B – DRAINAGE STATEMENT

1.0 PROPOSED FOUL DRAINAGE ARRANGEMENT

- 1.1 Foul water flows from the site are to drain by gravity into the 150mm drain along the main access road, to the west of the plot.
- 1.2 From there it will be conveyed to a pumping station serving the whole industrial estate, and pumped into the Thames Water sewer.
- 1.3 The pipe network is to remain private.

2.0 PROPOSED SURFACE WATER DRAINAGE STRATEGY

- 2.1 The surface water drainage system for Unit 5A-5B has been designed to accommodate the flows generated by a 1 in 100-year event, plus an allowance of 40% for climate change.
- 2.2 An initial engineering appraisal for the whole park was carried out by Haydn Evans Consulting in November 2013. The ground conditions indicate a topsoil layer of 200-400mm over fractured rock. Non fractured rock was encountered between 1.5 and 2.2mbgl. Infiltration tests to BRE365 were carried out and results were good in general, ranging from 5E-6m/s to 1.84E-4m/s. The permeable paving solution for surface water was proposed as a viable alternative.
- 2.3 In Autumn 2018 (October and November), a groundwater monitoring report was prepared by RSK Environment Ltd. The depth varied within the park but in some areas the water table was found as shallow as 0.89mbgl.

Table 1: Enzygo groundwater monitoring data Autumn 2018

Location	X	Y	18.10.18		24.10.18		31.10.18		14.11.18		
			GL (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)
BH1				1.3	-	1.26	-	1.19	-	1.01	-
BH2	447627.305	214814.004	69.118	0.93	68.188	1.1	68.018	1.21	67.908	1.13	67.988
BH3	447539.634	214698.974	69.621	1.11	68.511	1.2	68.421	1.32	68.301	1.27	68.351
BH4	447646.099	214755.091	68.884	0.89	67.994	1.02	67.864	1.12	67.764	1.08	67.804
BH5	447567.268	214619.444	70.344	2.32	68.024	2.34	68.004	2.47	67.874	2.54	67.804
BH6	447662.021	214663.078	69.998	2.34	67.658	2.45	67.548	2.55	67.448	2.56	67.438

Notes: X/Y-grid coordinates, GL-Ground Level, bgl-Below ground level, aOD-Above ordinance datum

Directors:

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A second round of visits took place in Spring 2019 with values even higher. The monitoring identified groundwater as shallow as 68.81m AOD in the west and 68.31m AOD in the east.

Table 2: RSK groundwater monitoring data Spring 2019

Location	X	Y		25.03.19		09.04.19		23.04.19		07.05.19	
			GL (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)
BH1				-	-	-	-	-	-	-	-
BH2	447627	214814	69.118	0.87	68.248	0.89	68.228	-	-	-	-
BH3	447539	214698	69.621	0.94	68.681	1.27	68.351	1.53	68.091	1.37	68.251
BH4	447646	214755	68.884	0.77	68.114	2.82*	66.064*	1.26	67.624	0.90	67.984
BH5	447567	214619	70.344	1.53	68.814	1.89	68.454	2.02	68.324	1.68	68.664
BH6	447662	214663	69.998	1.69	68.308	-	-	2.44	67.558	2.15	67.848

Notes: X/Y-grid coordinates, GL-Ground Level, bgl-Below ground level, aOD-Above ordinance datum
Notes: * results from BH4 on the 9.4.19 have not been considered as part of the overall assessment

- 2.4 Another Phase 2 Geo-Environmental report was produced by Enzygo Ltd in January 2019 for the northeaster corner, near plots 1, 3 and 5. In there, groundwater is noted to be as shallow as 0.9m bgl. Soakage tests were abandoned as a result.

Table 6.1 Ground and groundwater conditions check sequence of solid geology

Strata	Summary Description	Depths Encountered (m)
Made Ground	Firm consistency brown/orange brown silty sandy gravelly cobbly clay	GL to 0.80
Weathered Cornbrash Formation	Light brown sandy gravelly cobbles of limestone	0.50 to 3.20
	Soft orange brown silty sandy gravelly cobbly clay	0.30 to 2.10
Cornbrash Formation	Medium strong light brown/light grey limestone	6.60 to 9.80
Weathered Forest Marble Formation	Stiff light blueish grey silty gravelly clay	2.50 to 10.00
Groundwater	BH1 and BH2, SA1 to SA4, SA4a	GL to 0.60

- 2.5 All of the above testing was not site specific for Unit 5, although BRE 365 tests were carried out on adjacent plot 6 and 7. The most conservative value of the three repetitions was 5.39E-5m/s, which is far higher than the originally design value of 1E-5m/s. See Appendix A for results.
- 2.6 The SuDS hierarchy has been followed. It says that new developments should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:
- store rainwater for later use
 - **use infiltration techniques, such as porous surfaces in non-clay areas**
 - discharge rainwater direct to a watercourse
 - discharge rainwater to a surface water sewer/drain
 - discharge rainwater to the combined sewer.



- 2.7 Runoff from the roof and external hard landscaping areas (front car park and rear yard) will be discharged into the permeable paving subbase and, from there, it will percolate into the ground. The rear car park has some impermeable bitmac areas however the subbase of OGCR is installed throughout to maximise water storage capacity. See Appendix C for drainage layout.
- 2.8 The estimated runoff rate from the site is 0l/s. Some overland flows might be expected for storms beyond the design event, however these are difficult to quantify. They will not impact other buildings as they are at a higher elevation.
- 2.9 All parking bays to the front are to be constructed in permeable block paving to increase the water quality. This is where oil spillage is most likely to occur and the open graded crushed rock in the subbase will break down hydrocarbons before they percolate into the ground.
- 2.10 A catchment area plan has been produced where almost all site areas are included. Urban creep has not been considered as this is an industrial site and, more importantly, there is no extra areas to include in the catchment. See Appendix D
- 2.11 Full water quality discussion in line with CIRIA 753 - SUDS manual is in Appendix B.
- 2.12 The surface water networks will remain private, to be maintained as per the SuDS Maintenance Guide produced separately.

Yours sincerely

M. BLANCO
MEng GMICE
DIRECTOR

Authorised by

A. J. GRIFFITHS
BEng (Hons) MCIHT
DIRECTOR



Appendix A- BRE365 Test Results

Soakaway Design Calculations to BRE365 (DG 365 Revised 2016)



Infrastruct CS Ltd

Test Reference:	B7.1
Site:	Unit 7, OTP
Client:	Russel Wrapson
Test Date:	23/09/2022
Results logged by:	R.Ireanus

Calculations By:	RJW
Calculation Date:	13/10/2022
Length (m) =	1.40
Width (m) =	0.80
Depth (m) =	0.90

File ref:	4929-OTP7-13-001-BRE365 B7.1.xlsx
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First Fill	
Time [Mins]	Test 1 Depth [m]
0.00	0.10
5.00	0.21
10.00	0.31
15.00	0.41
20.00	0.49
25.00	0.57
30.00	0.63
35.00	0.68
40.00	0.72
45.00	0.76
50.00	0.79

Second Fill	
Time [Mins]	Test 2 Depth [m]
0.00	0.06
5.00	0.17
10.00	0.27
15.00	0.36
20.00	0.44
25.00	0.51
30.00	0.57
35.00	0.62
40.00	0.66
45.00	0.71
50.00	0.74
55.00	0.75
60.00	0.75

Third Fill	
Time [Mins]	Test 3 Depth [m]
0.00	0.11
5.00	0.22
10.00	0.33
15.00	0.43
20.00	0.51
25.00	0.59
30.00	0.66
35.00	0.71
40.00	0.76
45.00	0.81
50.00	0.87

RESULTS

Volume V _{p75 - 25} [m ³]	0.38640
Area A _{p50} [m ²]=	3.1220
Time t _{p75} 25 [s] =	1275
Surface Water Soil infiltration rate [m/s]	9.707E-05
Treated Effluent Soil infiltration rate (V _p) [s/mm]	3.70
Surface Water Soil infiltration rate [m/hr]	0.349

RESULTS

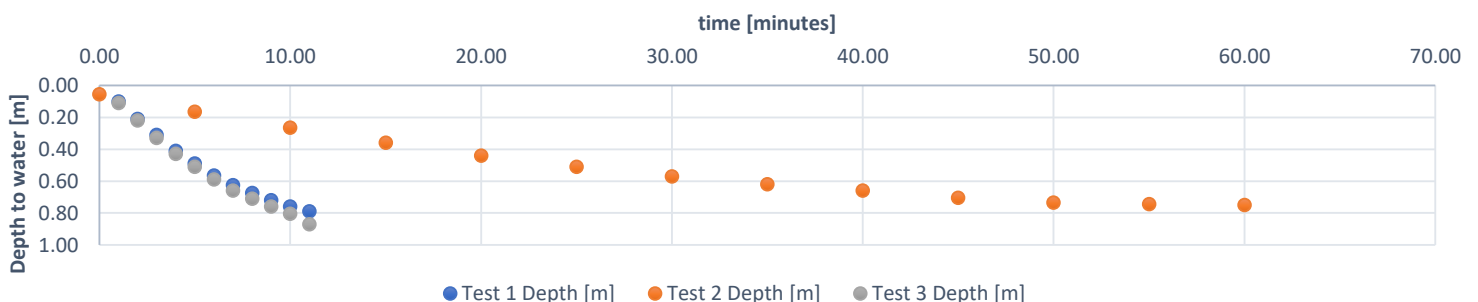
Volume V _{p75 - 25} [m ³]	0.38920
Area A _{p50} [m ²]=	3.3090
Time t _{p75} 25 [s] =	1346
Surface Water Soil infiltration rate [m/s]	8.737E-05
Treated Effluent Soil infiltration rate (V _p) [s/mm]	3.87
Surface Water Soil infiltration rate [m/hr]	0.315

RESULTS

Volume V _{p75 - 25} [m ³]	0.42560
Area A _{p50} [m ²]=	2.9240
Time t _{p75} 25 [s] =	1402
Surface Water Soil infiltration rate [m/s]	1.038E-04
Treated Effluent Soil infiltration rate (V _p) [s/mm]	3.69
Surface Water Soil infiltration rate [m/hr]	0.374

Slowest Soil Infiltration Rate [m/s] = 8.737E-05

Soakage Test Data



Soakaway Design Calculations to BRE365 (DG 365 Revised 2016)

Test Reference:	B6.1
Site:	Unit 7, OTP
Client:	Russel Wrapson
Test Date:	22/09/2022
Results logged by:	R.Ireanus

Calculations By:	RJW
Calculation Date:	13/10/2022
Length (m) =	1.40
Width (m) =	0.80
Depth (m) =	0.90



Infrastruct CS Ltd

File ref:	4929-OTP7-13-001-BRE365.xlsx
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First Fill	
Time [Mins]	Test 1 Depth [m]
0.00	0.39
5.00	0.46
10.00	0.52
15.00	0.56
20.00	0.60
25.00	0.64
30.00	0.68
35.00	0.71
40.00	0.73
45.00	0.75
50.00	0.77
55.00	0.79
60.00	0.80

Second Fill	
Time [Mins]	Test 2 Depth [m]
0.00	0.29
5.00	0.35
10.00	0.42
15.00	0.46
20.00	0.50
25.00	0.54
30.00	0.57
35.00	0.60
40.00	0.63
45.00	0.67
50.00	0.70
55.00	0.73
60.00	0.75

Third Fill	
Time [Mins]	Test 3 Depth [m]
0.00	0.30
5.00	0.37
15.00	0.44
20.00	0.48
25.00	0.52
30.00	0.56
35.00	0.60
40.00	0.63
45.00	0.66
50.00	0.70
55.00	0.73
60.00	0.76
65.00	0.79

RESULTS

Volume V _{p75-25} [m ³]	0.24640
Area A _{p50} [m ²]=	2.3960
Time t _{p75-25} [s] =	1750
Surface Water Soil infiltration rate [m/s]	5.876E-05
Treated Effluent Soil infiltration rate (V _p) [s/mm]	7.95
Surface Water Soil infiltration rate [m/hr]	0.212

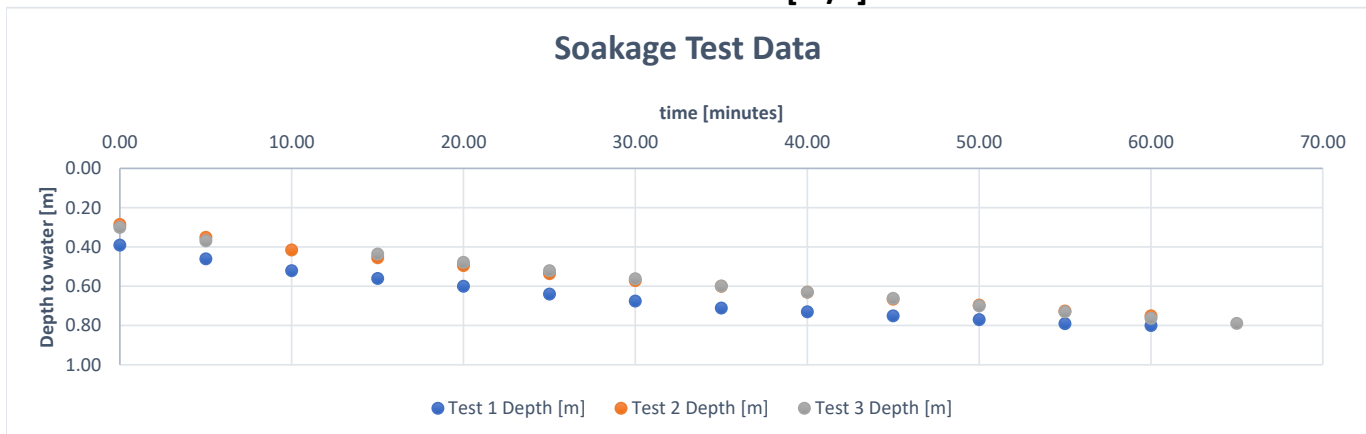
RESULTS

Volume V _{p75-25} [m ³]	0.27720
Area A _{p50} [m ²]=	2.7370
Time t _{p75-25} [s] =	2054
Surface Water Soil infiltration rate [m/s]	4.931E-05
Treated Effluent Soil infiltration rate (V _p) [s/mm]	8.30
Surface Water Soil infiltration rate [m/hr]	0.178

RESULTS

Volume V _{p75-25} [m ³]	0.29064
Area A _{p50} [m ²]=	2.6182
Time t _{p75-25} [s] =	2076
Surface Water Soil infiltration rate [m/s]	5.347E-05
Treated Effluent Soil infiltration rate (V _p) [s/mm]	8.00
Surface Water Soil infiltration rate [m/hr]	0.192

Slowest Soil Infiltration Rate [m/s] = 4.931E-05



Appendix B- Water quality

According to the CIRIA SUDS Manual, the pollution hazard level for car parks is low, and the simple index approach should be used.

TABLE 4.3 Minimum water quality management requirements for discharges to receiving surface waters and groundwater

Land use	Pollution hazard level	Requirements for discharge to surface waters, including coasts and estuaries ²	Requirements for discharge to groundwater
Residential roofs	Very low	Removal of gross solids and sediments only	
Individual property driveways, roofs (excluding residential), residential car parks, low traffic roads (eg cul de sacs, home zones, general access roads), non-residential car parking with infrequent change (eg schools, offices)	Low	Simple index approach ³ <i>Note: extra measures may be required for discharges to protected resources¹</i>	
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	Simple index approach ³ <i>Note: extra measures may be required for discharges to protected resources¹</i>	Simple index approach ³ <i>Note: extra measures may be required for discharges to protected resources¹</i> In England and Wales, Risk Screening ⁴ must be undertaken first to determine whether consultation with the environmental regulator is required. In Northern Ireland, the need for risk screening should be agreed with the environmental regulator.
Trunk roads and motorways	High	Follow the guidance and risk assessment process set out in HA (2009)	
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured, industrial sites	High	Discharges may require an environmental licence or permit ³ . Obtain pre-permitting advice from the environmental regulator. Risk assessment is likely to be required ⁵ .	

Table 4.3 of the SUDS Manual CIRIA C753. Page 63.

The method is guided by the land use and SuDS performance evidence. The steps to be followed are outlined below.



BOX 26.2 Steps of the simple index approach

Step 1 – Allocate suitable pollution hazard indices for the proposed land use

Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index

Step 3 – Where the discharge is to protected¹ surface waters or groundwater, consider the need for a more precautionary approach

Note:

1 Designated as those protected for the supply of drinking water (Table 4.3).

Box 26.2 of the SUDS Manual CIRIA C753. Page 567.

Step 1: Pollution hazard indices are presented in table 26.2 below. These indices range from 0 (no pollution hazard for this contaminant) to 1 (high pollution hazard for this contaminant type).

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

Table 26.2 of the SUDS Manual CIRIA C753. Page 568.

Step 2: To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index for each contaminant type that equals or exceeds the pollution hazard index. In this case the principal destination of the runoff is the ground, so table 26.4 should be used.

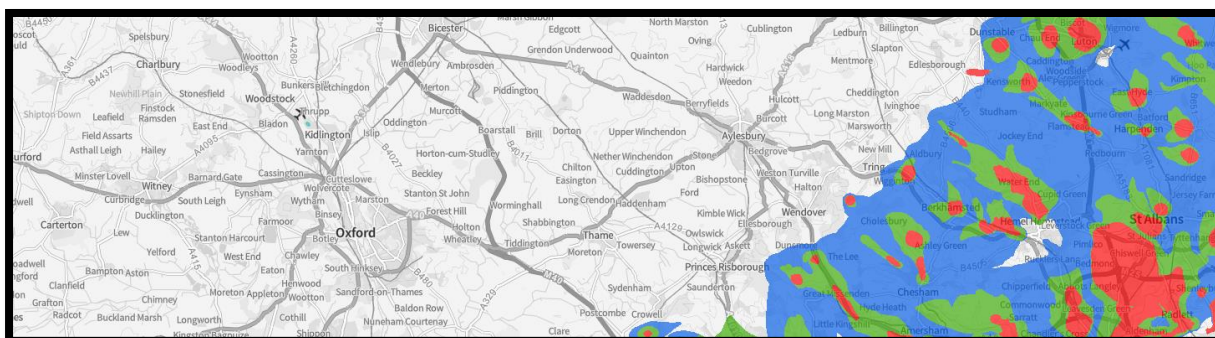
TABLE 26.4 Indicative SuDS mitigation indices for discharges to groundwater

Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates ¹	TSS	Metals	Hydrocarbons
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.6 ⁴	0.5	0.6
A soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.4 ⁴	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, ie graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20 mm gravel) underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.4 ⁴	0.4	0.4
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.8 ⁴	0.8	0.8
Proprietary treatment systems ^{5, 6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area.		

Table 26.3 of the SUDS Manual CIRIA C753. Page 569.

In this case, the mitigation indices are equal to the hazard indices which means the water quality treatment is adequate.

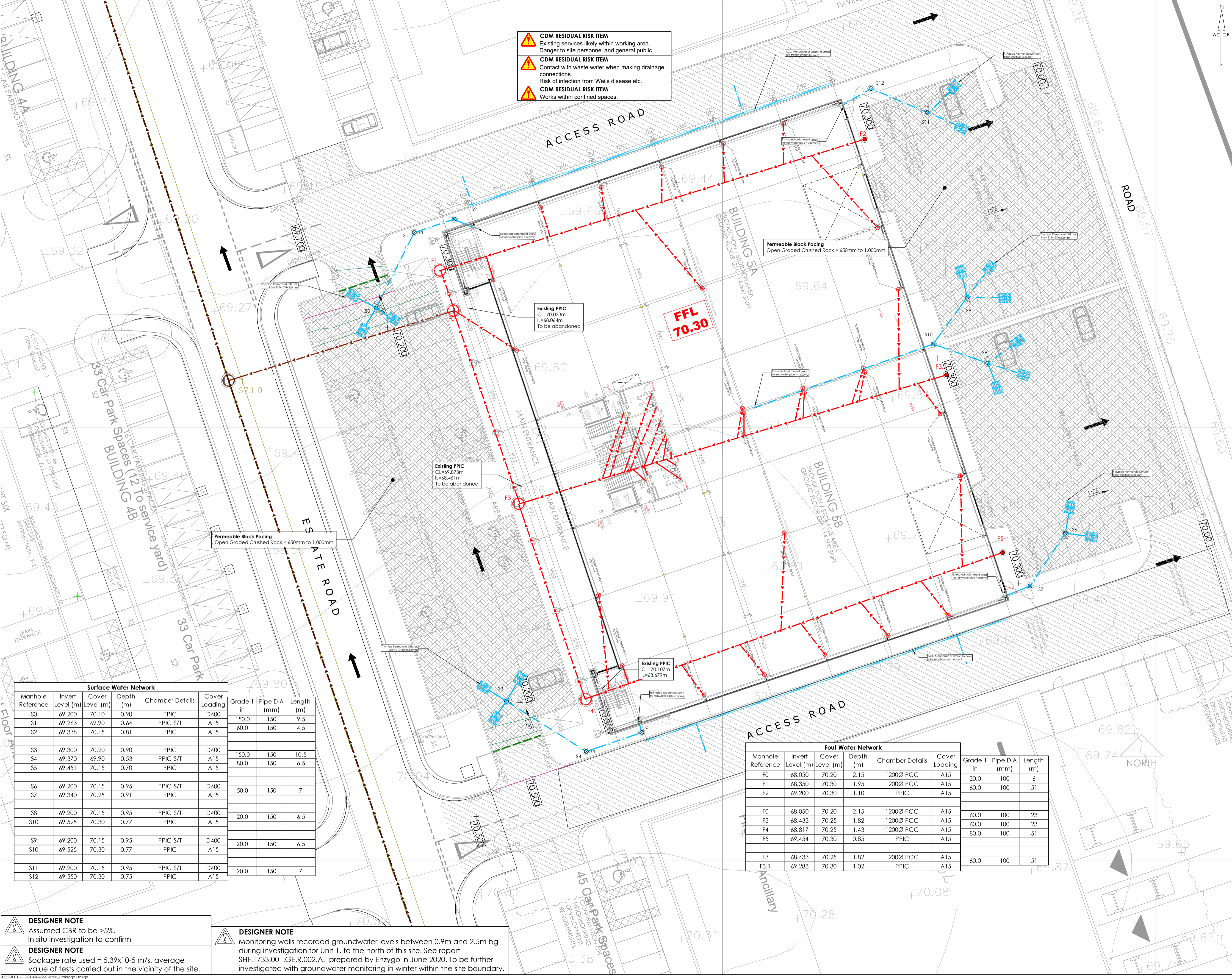
Step 3: Where the discharge is to protected groundwater, a more precautionary approach is needed. The site falls outside Source Protection Zone 1 and therefore no extra protection measures are needed.



Source Protection Zones map. Oxford is outside any protection zone.



Appendix C- Drainage Layout



- CDM RESIDUAL RISK ITEM**
Existing services likely within working area.
Danger to site personnel and general public.
- CDM RESIDUAL RISK ITEM**
Contact with waste water when making drainage connections.
Risk of infection from Weils disease etc.
- CDM RESIDUAL RISK ITEM**
Works within confined spaces.

- NOTES**
- All dimensions and levels are in metres unless otherwise noted
 - This drawing is to be read in conjunction with the relevant Architect's/Engineer's drawings, specifications and CDM documentation
 - This drawing has been produced electronically and may have been photo reduced or enlarged when copied. Work to figured dimensions only (DO NOT SCALE - EXCEPT FOR PLANNING PURPOSES). All dimensions to be checked on site. Any errors or omissions to be reported to the engineer immediately.
 - This drawing contains coloured lines / information that may not be clear if reproduced in black and white.
 - Digital copies of this plan can only be considered accurate if supplied directly by Infracore CS Ltd.

Construction Note
All footways to be laid to road falls to drain into private soft landscaped areas

DESIGNERS CDM NOTE - RESIDUAL RISKS IDENTIFIED

The design Engineer(s) have analysed this design as the scheme has been developed, in order to identify if there are any significant residual risk hazards (i.e. unusual, unexpected, abnormal or difficult).

Residual risks **HAVE** been identified and are therefore shown on this drawing. These risks have not been possible to remove by design.

This statement assumes that a competent Contractor with the appropriate qualified staff will be employed for the works, and that they will be familiar with site wide construction risks and hazards that they can reasonably be expected to encounter as part of their work.

- Drainage Key**
- Foul water drain (private/non adoptable)
 - Surface water drain (private/non adoptable)
 - Foul water sewer (Adoptable)

- Chamber Key**
- FW/SW**
- Mini access chamber (mac) - 300mmØ
 - PPIC - 475mmØ*
 - P.C.C. units/brick*
 - Adoptable demarcation manhole within 1m of boundary
 - Manhole
Depth: 1.25m to 1.5m*
Depth: 1.55m to 3.0m*

* General note
(Refer to standard details & longitudinal sections for chamber sizes. Size may need to increase dependent on number of incoming pipes/size of incoming pipes)

- Rain water down pipe (roadable access)
- Soil vent pipe/soil stack
- Silt Trap (ST) with removable silt bucket
- Manhole reference number
- Linear drainage channel
- Cellular storage (refer to drawing for sizes)
- Finished Floor Level (FFL)
- Block paving - permeable
- Baffle to prevent rapid through flow of water through permeable paving
- Impervious barrier to stop lateral movement of water
- RWP cellular discharge/collection unit (DU) (Permavoid or similar)

Surface Water Network						
Manhole Reference	Invert Level (m)	Cover Level (m)	Depth (m)	Chamber Details	Cover Loading	Length (m)
S0	69.200	70.10	0.90	PPIC	D400	
S1	69.263	69.90	0.64	PPIC S/T	A15	9.5
S2	69.338	70.15	0.81	PPIC	A15	4.5
S3	69.300	70.20	0.90	PPIC	D400	10.5
S4	69.370	69.90	0.53	PPIC S/T	A15	6.5
S5	69.451	70.15	0.70	PPIC	A15	
S6	69.200	70.15	0.95	PPIC S/T	D400	7
S7	69.340	70.25	0.91	PPIC	A15	
S8	69.200	70.15	0.95	PPIC S/T	D400	6.5
S10	69.525	70.30	0.77	PPIC	A15	
S9	69.200	70.15	0.95	PPIC S/T	D400	6.5
S10	69.525	70.30	0.77	PPIC	A15	
S11	69.200	70.15	0.95	PPIC S/T	D400	7
S12	69.550	70.30	0.75	PPIC	A15	

Grade	Pipe DIA (mm)	Length (m)
150.0	150	9.5
60.0	150	4.5
150.0	150	10.5
80.0	150	6.5
50.0	150	7
20.0	150	6.5
20.0	150	6.5
20.0	150	6.5
20.0	150	7

Foul Water Network						
Manhole Reference	Invert Level (m)	Cover Level (m)	Depth (m)	Chamber Details	Cover Loading	Length (m)
F0	68.050	70.20	2.15	1200Ø PCC	A15	6
F1	68.350	70.30	1.95	1200Ø PCC	A15	51
F2	69.200	70.30	1.10	PPIC	A15	
F3	68.050	70.20	2.15	1200Ø PCC	A15	23
F4	68.817	70.25	1.43	1200Ø PCC	A15	23
F5	69.454	70.30	0.85	PPIC	A15	51
F3	68.433	70.25	1.82	1200Ø PCC	A15	51
F3.1	69.283	70.30	1.02	PPIC	A15	

Grade	Pipe DIA (mm)	Length (m)
20.0	100	6
60.0	100	51
60.0	100	23
60.0	100	23
80.0	100	51
60.0	100	51

- DESIGNER NOTE**
Assumed CBR to be >5%.
In situ investigation to confirm
- DESIGNER NOTE**
Soakage rate used = 5.39x10⁻⁵ m/s, average value of tests carried out in the vicinity of the site.

- DESIGNER NOTE**
Monitoring wells recorded groundwater levels between 0.9m and 2.5m bgl during investigation for Unit 1, to the north of this site. See report SHF.1733.001.GE.R.002.A. prepared by Enzygo in June 2020. To be further investigated with groundwater monitoring in winter within the site boundary.

REV	DATE	BY	CHKD	REVISION COMMENTS	ISSUE DATE
P05	15/12/21	MBD	RJW	Internal chambers removed	15/12/21
P04	14/12/21	IMT	MBD	Roof layout added	14/12/21
P03	23/11/21	IMT	MBD	Rainwater diffusers added	23/11/21
P02	22/10/21	IMT	MBD	Foul water added. Soakaway relocated	22/10/21
P01	30/09/21	IMT	MBD	Initial issue	30/09/21

DRAINAGE DESIGN
SHEET NO. 1/1

PROJECT
Building 5A & 5B
Oxford Technology Park
Killington, Oxon

CLIENT

SWJ Consulting Ltd

Infracore CS Ltd

SCALE @ A1
1:200

PROJECT NUMBER: 4553
STATUS: S2
ISSUE PURPOSE: INFORMATION

TECH: ICS
ORIGIN: 01
PHASE: XX
LEVEL: DR
TYPE: C
ROLE: DR
NO.: 0200
REVISION: P05



Infrastruct CS Ltd
Consulting Civil Engineers

Appendix D- Catchment Area Plan

